

1 23. (Amended) The encoder/decoder of claim 22, characterized by said codebook selector
2 cyclically stepping through each codebook identification in a set of codebooks.

1 24. (Amended) The encoder/decoder of claim 22, wherein said codebook selector randomly
2 steps through each codebook identification in a set of codebooks.

REMARKS

Reconsideration and allowance are respectfully requested in view of the foregoing amendments and the following remarks.

Claims 1-25 are currently pending. Claims 1-3, 12-14, 19, and 22-24 have been amended. Support for these amendments may be found on page 5, line 20 to page 6, line 7 of the application. No new matter has been introduced. A marked-up version of the amended claims is attached as Appendix A, and a clean copy of the pending claims is attached as Appendix B.

In the Office Action mailed September 22, 2001, claims 1-3, 7-14, 16-19, 21-22, and 24-25 were rejected under 35 U.S.C. 103(a) as being unpatentable over Kao et al. (U.S. Patent No. 5,371,853, hereinafter "Kao") in view of Lin, ("Ultra-Fast CELP Coding Using Deterministic Multi-Codebook Innovations", ICASSP 1992, International Conference on Acoustics, Speech and Signal Processing, vol. 1, pages 317-320, hereinafter "Lin").

The principles of the present invention are generally directed to a multi-codebook CELP encoding/decoding method and apparatus, and a multi-codebook structure. To perform the

encoding/decoding operations on signal blocks, a corresponding codebook identification is selected by utilizing a deterministic selection procedure that is independent of signal type, and applied to the signal blocks.

Kao is generally directed to an apparatus and method for encoding speech using a codebook excited linear predicative (CELP) speech processor that uses an algebraic codebook. To perform the speech encoding, the CELP processor utilizes a deterministic, non-overlapping codebook with a predetermined number of vectors that are uniformly distributed over a multi-dimensional sphere to determine an algebraic codebook index and gain that best matches a long term speech residual of the speech signal.

Lin is generally directed to ultra-fast CELP coding using an innovation signal which is modeled using a multisection codebook of deterministic code sequences. The vectors of the multisection codebook are constructed from a basis vector partition scheme for a Hadamard matrix to form a deterministic vector sum code.

Independent claim 1, as amended, is directed to a multi-codebook fixed bitrate CELP signal block encoding/decoding method that includes selecting, for each signal block, a corresponding codebook identification utilizing a deterministic selection procedure that is “independent of signal type” and encoding/decoding each signal block by using a codebook having said selected codebook identification”. Applicants respectfully submit that Kao fails to teach or suggest the features of claim 1.

The Office Action cites column 9, lines 26 and 27 of Kao as teaching deterministic codebook selection. Applicants respectfully disagree with this assertion. Kao describes the construction of a CELP codebook in which the vectors of the codebook are formed in a deterministic manner. The deterministic codebook of Kao is generated by partitioning each sixty element vector of the codebook into three equal length subvectors. Each 20 element subvector has four non-zero elements of 1 or -1, resulting in the following possible combination of non-zero elements for each subvector: four 1's, four -1's, or two 1's and two -1's. This procedure allows eight possible combinations for each subvector of 20 elements, resulting in each vector having 2^9 combinations. As a result, a codebook size of 2^9 is defined, which requires 9 bits for encoding the codebook index specifying each vector in the codebook.

To contrast, the construction of a deterministic codebook as described by Kao is completely different from “selecting ... a codebook identification utilizing a deterministic selection procedure that is independent of signal type” (claim 1, lines 3-5), as claimed. Kao describes a method for construction a codebook in which the vectors of the codebook are determined in a deterministic manner during codebook construction. The codebook index is used to identify the particular vector of the codebook chosen during the encoding operation. In contrast, the invention of claim 1 is directed to the selection of a particular codebook (not construction of a codebook as described by Kao). The selection is identified by a codebook identifier using a deterministic selection procedure that is independent of signal type. Kao does not teach or suggest selection of a particular codebook using a procedure that is independent of signal type.

The Lin reference fails to overcome the deficiencies of Kao. Similar to Kao, Lin fails to teach or suggest “selecting, for each signal block, a corresponding codebook identification utilizing a deterministic selection procedure that is independent of signal type” as claimed in claim 1. In view of the foregoing, Applicants respectfully submit that the invention of claim 1 is not taught or suggested by either Kao or Lin, alone or in combination.

Independent claim 12, as amended, is directed to a multi-codebook fixed bitrate CELP signal block encoder/decoder which includes “a codebook selector for selecting, for each signal block, a corresponding codebook identification utilizing a deterministic selection procedure that is independent of signal type” (claim 12, lines 3-5). For similar reasons as those discussed in regard to the rejection of claim 1, Applicants respectfully submit that the invention of claim 12 is not taught or suggested by either Kao or Lin, alone or in combination.

Independent claim 19, as amended, is directed to a codebook selection method for multi-codebook fixed bitrate CELP signal block encoding/decoding including “selecting, for each signal block, a corresponding codebook identification utilizing a deterministic selection procedure that is independent of signal type” (claim 19, lines 4-6). For similar reasons as those discussed in relation to claim 1, Applicants respectfully submit that the invention of claim 19 is also not taught or suggested by either Kao or Lin, alone or in combination.

Independent claim 22, as amended, is directed to a codebook selection apparatus for multi-codebook fixed bitrate CELP signal block encoding/decoding including “a codebook selector for selecting, for each signal block, a corresponding codebook identification utilizing a deterministic

selection procedure that is independent of signal type” (claim 22, lines 4-6). For similar reasons as those discussed in relation to claim 1, Applicants respectfully submit that the invention of claim 22 is also not taught or suggested by either Kao or Lin, alone or in combination.

Independent claim 25 is directed to an algebraic multi-codebook structure, wherein “each codebook has separate tracks with different predetermined allowed pulse positions and excluded pulse positions; and each codebook has different excluded pulse positions” (claim 25, lines 2-4). Although the Office Action does not include a specific discussion of claim 25, Applicants respectfully submit that neither Kao or Lin teach the features of claim 25. For example, neither Kao or Lin teach or suggest an algebraic multi-codebook structure “wherein each codebook has separate tracks with different predetermined allowed pulse positions and excluded pulse positions”. Kao describes the construction of a single codebook, and does not teach or suggest a multi-codebook structure wherein “each codebook has separate tracks with different predetermined pulse positions and excluded pulse positions”. The Lin reference fails to cure the deficiencies of Kao. Lin is generally directed to ultra-fast CELP coding using an innovation signal which is modeled using a multisection codebook of deterministic code sequences and also fails to teach or suggest a multi-codebook structure wherein “each codebook has separate tracks with different predetermined pulse positions and excluded pulse positions”.

Claims 2-11, 13-18, 20-21, and 23-24, are dependent from independent claims 1, 12, 19, and 22, respectively, and should be allowable for at least the same reasons. Accordingly, Applicants

respectfully submit that claims 2-11, 13-18, 20-21, and 23-24 are also not taught or suggested by either the Kao or Lin reference.

In the Office Action, dependent claims 4-6, 15, 20 and 23 were rejected under 35 U.S.C. 103(a) as being unpatentable over Kao in view of Lin in view of Heidari et al. (U.S. Patent No. 6,055,496, hereinafter “Heidari”). Claims 4-6, 15, 20, and 23 are dependent upon their respective independent claims 1, 12, 19, and 22, which, as described hereinabove, have not been found to be taught or suggested by either the Kao or Lin reference. Heidari fails to overcome the deficiencies of Kao and Lin.

Heidari is generally directed to a process for the generation of codevectors in the production of synthetic speech using an algebraic vector quantized CELP speech coder. Heidari describes a fixed codebook used to generate a sequence of possible codevectors and further provides for a circular shift of codevectors outputted by the fixed codebook to obtain more codevectors for the generation of codewords. However, Heidari fails to teach or suggest “selecting, for each signal block, a corresponding codebook identification utilizing a deterministic selection procedure that is independent of signal type”, as claimed in claims 1, 12, 19, and 22.

In addition, with regard to claims 6, 15, 20, and 23, the Office Action cited the abstract and column 9, lines 1-64 of Heidari as teaching circular shifting during a codebook search. The cited portion of Heidari describes the circular shifting of the codevectors of a fixed codebook. In contrast, the claimed invention of claims 6, 15, 20, and 23 states that the deterministic selection procedure is

independent of signal type and includes “cyclically stepping through each codebook identification in several sets of codebooks”. This feature is not taught or suggested by Heidari.

In view of the foregoing discussion, Applicants respectfully submit that claims 1-25 of the present application distinguish over the Kao, Lin, and Heidari references, alone and in combination.

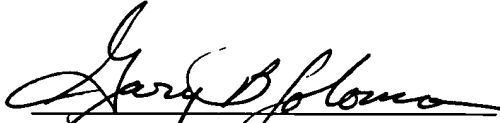
Should the Examiner have any further questions or comments facilitating allowance, the Examiner is invited to contact Applicant’s representative indicated below to further prosecution of this application to allowance and issuance.

In view of the above, it is believed that this application is in condition for allowance, and such a Notice is respectfully requested.

Respectfully submitted,

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